

# THE MINERAL INDUSTRY OF TAIWAN

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Taiwan is an island that is located south of Japan and east of mainland China in the Pacific Ocean. In 2004, Taiwan's economy grew by 5.7%, which was the largest increase since 2000. After reaching a peak of 7.9% in the second quarter, the economy slowed to 3.3% in the fourth quarter because of higher global oil prices and the deceleration of export growth during the second half of the year. The economic growth was generated by private consumption and investment. Private consumption increased by 3.1% and private investment rose by 28.2% compared with that of the previous year. The recovery of the information and communication technologies industry was the main reason for the increased business investment. In 2004, Government fixed investment decreased by 4.2% because of higher prices on construction materials and because some construction projects were postponed. The island's gross domestic product (GDP) increased to \$305.4 billion and the per capita income of the island's 22.6 million people increased to \$13,529 (Department of Statistics, 2005).

Because it has limited mineral resources, Taiwan imported various minerals to meet its increasing demand. In 2004, the production index for the mining sector decreased by 4.42% compared with that of 2003. Mining accounted for only 0.1% of the total industrial production output value. The manufacturing output value of fuels, industrial minerals, and metals accounted for 22.0% of the total output value. Domestic fuel supplies accounted for 1.54% of the island's total fuels demand. Iron and steel was the leading metal production sector on the island. The production of other value-added manufacturing products, such as those made of aluminum and copper, depended upon imported metals and scrap (Ministry of Economic Affairs, 2005a§, <sup>1</sup> b§).

Before 2004, the Taiwan authorities' development policy was centered on the manufacturing sector. Since the late 1980s, however, Taiwan's manufacturing sector has relocated most of its production base to China, which has affected Taiwan's industry structure. The service sector now accounts for a large share of the GDP, although during the recent economic recovery, real output growth of the industrial sector still outpaced that of the service sector.

In 2004, Taiwan's Council for Economic Planning and Development (CEPD) developed guidelines and action plans to promote the knowledge-intensive service sector as the new catalyst for economic growth in the next decade despite fierce global competition. The Taiwan authorities believed that high levels of service sector development would add value to products in the agricultural and manufacturing sectors, improve Taiwan's core competitive edge, and strengthen the industrial sector. The improvement of service would encourage Taiwanese businesses to stay in Taiwan and would attract foreign businesses to set up global logistics centers in Taiwan. Developing service industries such as entertainment, environmental protection, medicine and healthcare, and tourism and sports recreation would enhance the quality of life in Taiwan. The CEPD projected that the service sector would grow 6.1% per year through 2008 and that the percentage of the GDP generated by the service sector would increase to 67% in 2008 from 63.5% in 2003 (Taiwan Headlines, 2004b§; 2005d§).

The Taiwan authorities carried out the second phase of Taiwan's financial reform program in 2004. The number of state-owned banks (banks in which the government held 30% or more interest) would be reduced to 6 from 12 at yearend 2005. At least three of the domestic banks would each have more than 10% market share. The number of financial holding companies would also be reduced to 7 from 12 by yearend 2006. The ultimate goal was to build Taiwan into a regional financial service center in the Asia and the Pacific region. The Taiwan authorities will provide tax and business incentives to encourage mergers and acquisitions among financial institutions. Financial holding companies with more than 10% domestic market share will be allowed to set up branches abroad. Poorly performing banks will be encouraged to seek merger with more-competitive financial institutions. The government's share of Taiwan Cooperative Bank will be reduced to 47.53% from 60% in April 2005, and the state-owned Bank of Taiwan and Land Bank of Taiwan planned to issue shares of stock to the public. All three of the banks were also considering merger with other financial institutions. About 46% of the government's share of the Bank of Overseas Chinese was sold to a private financial institution (Polaris Securities Group), and Chang Hwa Bank planned to sell 37.28% of its shares to foreign investors. The Fair Trade Commission of the Executive Yuan approved General Electric Capital Taiwan Holding Co.'s (a subsidiary of General Electric Co. of the United States) application to acquire 40% to 49% of Cosmos Bank (China Post, 2005b§; Taiwan Headlines, 2005c§).

Taiwan was not a signatory to the Kyoto Protocol. The Ministry of Economic Affairs (MOEA), however, planned to announce limits on greenhouse gas emissions for various industrial sectors that will be within the guidelines of international standards. Taiwan ranked 22d on the list of the world's highest carbon-dioxide-producing areas and accounted for 1% of annual industrial emissions worldwide. Taiwan's Environmental Protection Administration and Taiwan Semiconductor Industry Association (TSIA) signed an agreement that members of TSIA would voluntarily reduce perfluorocarbon emissions to the average standard set from 1997 to 1998 by 2010. Officials of MOEA also urged Taiwan's chemical companies to take early action to address the new international environmental protection requirements; otherwise, Taiwan's chemical industry could gradually lose its international competitiveness (China Post, 2005c§; Taipei Times, 2005§).

## Trade

In 2004, Taiwan's total trade increased by 26.0% to \$341.9 billion. The values of exports and imports increased to \$174.0 billion and \$167.9 billion, respectively. Crude oil remained the leading imported mineral commodity by value and was followed by coal,

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<sup>1</sup>References that include a section mark (§) are found in the Internet References Cited section.

natural gas, iron ore, marble, and kaolin. Taiwan's leading exports were products of capital- and technology-intensive sectors and included base-metal products, electrical equipment, musical instruments, and precision instruments. Traditional labor-intensive products, such as cement, footwear, and textiles, had decreased significantly during the past decade in terms of export value and percentage share of total exports. Many of Taiwan's labor-intensive industries set up plants in mainland China during the last decade. They either focused on the Chinese market to take advantage of its overwhelming consumption growth or received their orders from Taiwan and produced their goods in mainland China and then shipped them to overseas buyers. During the past several years, about 60% of Taiwan's steel exports were shipped to China. In 2004, Japan replaced China as Taiwan's leading trading partner. Taiwan's total trade with Japan was \$60.4 billion followed by mainland China, with \$53.8 billion, and the United States, with \$52.9 billion (Ministry of Finance, 2004a, b).

## Commodity Review

### *Metals*

**Aluminum.**—Without any primary aluminum production on the island, aluminum product producers depended on imports of aluminum ingot and scrap to meet their needs. Owing to high production costs and a shortage of raw materials, many aluminum producers either closed down their operations or moved their production facilities to China during the past several years. In 2004, China Steel Aluminum Corp. (CS Aluminum) [a subsidiary of China Steel Corp. (CSC)] started trial production at its 35,000-metric-ton-per-year (t/yr) aluminum rolling mill (Ningpo Huayuan Aluminum-Tech Corp.) in Ningpo, Zhejiang Province, China. CS Aluminum produced about 150,000 metric tons (t) of aluminum alloy semimanufactured products and exported about 25% of its products. The remainder was sold on the domestic market. CS Aluminum renovated its alloy plant in Koahsiung during the past 2 years and increased its output capacity to 200,000 t/yr in 2004. CS Aluminum aimed to produce 200,000 t aluminum alloy ingot and semimanufactured products from imported aluminum ingot in 2005. In 2004, Taiwan imported 419,126 t of aluminum ingot; of that total, Australia provided 160,812 t; China, 147,881 t; and South Africa, 51,519 t (Ministry of Finance, 2004b, p. 634).

**Copper.**—Without any refined copper production, the island relied on imported copper to meet its demand. Because of surging demand for copper from the electronics sector, Taiwan's copper consumption was estimated to have increased to 660,000 t in 2004 from 615,000 t in 2003. In 2004, Taiwan imported 676,463 t of refined copper mainly from Chile (297,151 t), Australia (90,870 t), Japan (62,449 t), and Peru (58,881 t) (Ministry of Finance, 2004b, p. 623).

**Iron and Steel.**—Taiwan was the fifth leading crude steel producer in Asia behind China, Japan, the Republic of Korea, and India. CSC, which was the leading steel producer and the only pig iron producer in Taiwan, depended on imports of iron ore to meet its demand. Iron ore imports were mainly from Australia (5.25 Mt) and Brazil (3.01 Mt) in 2004 (Ministry of Finance, 2004b, p. 113). The increased price of iron ore affected CSC's profit margin. Even though CSC had signed long-term supply contracts with overseas suppliers, the company was considering investment opportunities in iron ore and coal mines in other countries. The company evaluated the feasibility of the Camarines iron ore mine in the Philippines to secure a steady supply of iron ore over the longer term (China Post, 2005a\$).

CSC planned to reline its No. 2 blast furnace and to expand the inner volume of the furnace by 15% to between 3,300 and 3,400 cubic meters (m<sup>3</sup>) from 2,850 m<sup>3</sup> in 2005. After the expansion, pig iron production was expected to increase by between 300,000 and 400,000 t/yr. CSC and its affiliate Kuei Yi Industrial Co. planned to build an iron and steel plant in Taichung that would have an output capacity of 3.6 Mt/yr of crude steel. The plant was designed to have either one large blast furnace or two small blast furnaces. The blast furnace operation was scheduled to start in 2007 (Southeast Asia Iron and Steel Institute Newsletter, 2004).

The Executive Yuan approved Formosa Plastics Group's (FPG) request to build an integrated iron and steel plant at Yunlin Offshore Industrial Zone in Yunlin County. The construction cost for the 7.5-Mt/yr steel plant was estimated to be \$4.3 billion. The proposed plant would be subject to the new carbon-dioxide-emission regulation, and FPG expected that it would take 2 years to complete an environmental impact assessment study. The new plant was scheduled to begin operation in 2009 (Taiwan Headlines, 2005b\$). FPG also received approval from the Chinese Government to build a 400,000-t/yr steel plant in Ningpo, Zhejiang Province. FPG established a subsidiary company (Hua Ye Steel Co.) to run the plant, which would have an output capacity of 250,000 t/yr of hot-dipped galvanizing line and 150,000 t/yr of color-coating line. Initial investment was estimated to be \$18 million (Metal Bulletin, 2004a).

In 2004, Yieh United Steel Corp. (Yusco), which was the leading stainless steel producer on the island, planned to reduce its stainless steel output by 30% in July 2005. The company's stainless steel output capacity was 1 Mt/yr. During the past 2 years, the prices of nickel on the international market increased sharply but the market prices of stainless steel products remained low. Because stainless steel producers accounted for about two-thirds of the demand for nickel, the reduction in stainless steel production was expected to reduce the need for nickel. Yusco consumed an average of about 4,000 t of nickel per month and produced about 1 Mt of stainless steel in 2004. In October 2004, Yusco started up its 300,000-t/yr stainless steel cold-rolling mill in Huangpu, Guangzhou, Guangdong Province, China. Hot-rolled feed for the plant was from Yusco's Kaohsiung plant. The plant was capable of producing 200, 300, and 400 series stainless steel cold-rolled products for the market in southern China (Metal Bulletin, 2004b, c; China Post, 2005d\$).

Feng Hsin Iron and Steel Co. Ltd. planned to replace its two small electric arc furnaces with a large one at its No. 1 plant. A new ladle furnace was also included in the upgraded plan. Feng Hsin started up its 700,000-t/yr capacity 3-strand billet caster, which was supplied by Danieli Co. of Italy in 2004 (Metal Bulletin, 2004b).

**Cement.**—Owing to an increased demand for construction materials in 2004, the production of cement increased slightly. Domestic demand for cement gradually decreased to 14.8 Mt in 2004 from 27.9 million metric tons (Mt) in 1993. Owing to a lack of limestone resources and limited market appetite on the island, Taiwan cement producers gradually moved their production base to China in the late 1990s and expanded their cement output capacities there. Chia Hsin Cement Corp. increased cement production to 5.5 Mt from 2.8 Mt by adding a new plant (Union Cement) in Jiangsu Province, China. Universal Cement Corp. planned to build a cement plant in Huizhou, Guangdong Province. Universal was expected to have a total cement output capacity of 3 Mt in mainland China. In addition to a cement plant in Jiangxi Province, Asia Cement Corp. was building a cement plant in Sichuan Province and another one in Wuhan, Hubei Province (Taiwan Economic News, 2005a\$).

Taiwan Cement Corp.'s (TCC) mainland China cement project was positioned to take advantage of the market in southern China. TCC's investment strategy in China was to make direct investments and to form joint ventures with local cement producers. TCC and Conch Cement Group of mainland China set up a joint-venture cement plant in Xuzhou, Jiangsu Province. TCC had two wholly owned grinding plants in Juchiachiao, Anhui Province and Fuzhou, Fujian Province. TCC was building a cement plant in Yungde, Guangdong Province and a grinding plant in Liuzhou, Guangxi Province. During the past several years, the company invested \$100 million in mainland China, and the output capacity of its plants was expected to reach 10 Mt by yearend 2005. TCC planned to invest \$300 million to expand capacities at its existing cement plants and to build new plants in southern China during the next 3 years. The company's total cement output capacity in mainland China was expected to reach 20 million metric tons per year (Mt/yr) in 2008. Demand for high-grade cement in southern China was 120 Mt; local cement producers could supply about 20% to 30% of that demand (Taiwan Economic News, 2005b\$).

## Mineral Fuels

**Coal.**—Without any coal production, Taiwan depended on imported coal to meet its demand. Taiwan Power Co. (Taipower) was the leading coal consumer on the island and imported about 52% of Taiwan's coal imports. To reduce shipping costs, the Taiwan authorities approved Taipower's importation from China of up to 30% of the company's total coal requirements. The company planned to increase coal purchases from Indonesia and China and to reduce coal imports from Australia, South Africa, and the United States. The company also planned to increase the percentage of coal purchases made on the spot market to 60% in 2004 compared with 35% in 2002, and to consider investing in coal mines in China. Investment in China would have to be approved by the Taiwan authorities. In 2004, Taiwan imported a total of 60.75 Mt of coal; of this total, Indonesia provided 19.58 Mt; China, 18.95 Mt; and Australia, 17.93 Mt (Ministry of Finance, 2004b, p. 116).

**Natural Gas and Petroleum.**—FPG's subsidiary Formosa Petrochemical Corp. estimated that earnings from oil sales would exceed those from petrochemical products within the next 2 years. To address this expected boom in the oil-products market, Formosa Petrochemical invested \$295 million to expand its daily oil-refinery capacity to 600,000 barrels (bbl) in 2006 from 450,000 bbl in 2004. Formosa Petrochemical exported between 60% and 70% of its total output. Formosa Petroleum depended on imported oil to feed its refinery because domestic oil production accounted for less than 2% of the island demand. FPG's naphtha-cracking complex at Mailiao, Yunlin County, also concentrated on oil products (Taiwan Headlines, 2004a\$).

The Executive Yuan approved Chinese Petroleum Corp.'s (CPC) and its partners' request to invest \$12 billion to build a petrochemical industrial park in Yunlin County. Initially, CPC held 49% interest in the petrochemical project, and the remaining 51% went to other interested participants. Two financial groups, China Trust Holding Co. and Fubon Holding Co., decided to pull out of the project and CPC increased its initial investment fund to \$3.14 billion from \$37.73 million. The remaining capital will be raised through syndicated loans. Other interested participants included Chang Chun Petrochemical Co., China Man-made Fiber Corp., Far Eastern Group, Ho Tung Chemical Corp., and Lee Chang Yung Chemical Industry Corp. The petrochemical project was scheduled to begin operation in 2010 (Taiwan Headlines, 2005a\$).

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TABLE 1  
TAIWAN: PRODUCTION OF MINERAL COMMODITIES<sup>1</sup>

(Metric tons unless otherwise specified)

Commodity		2000	2001	2002	2003	2004
<b>METALS</b>						
Gold, primary	kilograms	9	2	--	--	--
Iron and steel, metal:						
Pig iron	thousand metric tons	9,971	10,316	10,524	10,779	10,198
Ferrosilicon		2,975	1,181	--	--	--
Steel, crude	thousand metric tons	17,302	17,336	18,255	18,832 <sup>r</sup>	19,604
Nickel, refined <sup>c</sup>		10,000	11,000	11,000	11,000	11,000
<b>INDUSTRIAL MINERALS</b>						
Cement, hydraulic	thousand metric tons	17,572	18,128	19,363	18,474	19,050
Feldspar		409	147	--	510	900
Fire clay		3,666	5,641	2,083	7,546	3,686
Gypsum, precipitated		1,884	1,006	--	--	--
Lime <sup>c</sup>		800,000	800,000	800,000	800,000	800,000
Mica		6,862	9,733	6,595	3,237	2,973
Nitrogen, N content of ammonia		11,004	11,870	11,050	11,200	11,000
Salt, marine		69,521	66,150	56,720	191	--
Sodium compounds, n.e.s.:						
Caustic soda		426,040	466,630	508,760	568,180	570,000 <sup>c</sup>
Soda ash <sup>c</sup>		140,000	140,000	140,000	140,000	140,000
Stone:						
Dolomite	thousand metric tons	119	71	55	54	115
Limestone	do.	3,505	4,901	3,677	1,434	213
Marble	do.	17,831	20,475	23,736	21,041	22,970
Serpentine	do.	395	276	268	194	229
Sulfur		205,588	223,659	212,343	225,006	222,670
Talc		--	130	27	466	410
<b>MINERAL FUELS AND RELATED MATERIALS</b>						
Coal, bituminous		83,380	--	--	--	--
Gas, natural:						
Gross	million cubic meters	742	849	887	831	796
Marketed <sup>c</sup>	do.	670	780	785	760	720
Petroleum:						
Crude	thousand 42-gallon barrels	234	279	321	288	280
Refinery products <sup>c</sup>	do.	240,000	250,000	260,000	270,000	280,000

<sup>c</sup>Estimated; estimated data are rounded to no more than three significant digits. <sup>r</sup>Revised. -- Zero.

<sup>1</sup>Includes data available through September 30, 2005.

TABLE 2  
TAIWAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2004

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity <sup>c</sup>
Cement		Asia Cement Corp.	Hsinchu	1,800
Do.		do.	Hualien	4,020
Do.		Chia Hsin Cement Corp.	Kaohsiung	1,860
Do.		Chien Tai Cement Co. Ltd.	do.	1,720
Do.		Lucky Cement Corp.	Tungao	2,000
Do.		Southeast Cement Corp.	Kaohsiung	1,090
Do.		do.	Chutung	1,400
Do.		Taiwan Cement Corp.	Hualien City	1,600
Do.		do.	Hualien County	5,600
Do.		do.	Suao	3,400
Do.		Universal Cement Corp.	Kaohsiung	1,550
Marble		Taiwan Marble Co., Ltd.	Panchiao	10
Nickel		Taiwan Nickel Refinery	Kaohsiung	14
Petroleum:				
Crude	thousand 42-gallon barrels per year	Chinese Petroleum Corp.	Chuhuangkeng and Tungtzuchiao	850
Refinery products	thousand 42-gallon barrels per day	do.	Kaohsiung	570
Do.	do.	do.	Taoyuan	200
Do.	do.	Formosa Plastics Group	Yunlin	450
Steel		China Steel Corp.	Kaohsiung	13,000
Do.		Feng Hsin Iron and Steel Co. Ltd.	Taichung Hsien	1,000
Do.		Yieh United Steel Co.	do.	1,000
Sulfur		China Petrochemical Development Corp.	Taipei	50
Titanium dioxide		DuPont Far East Co. Ltd.	Guanyin	100

<sup>c</sup>Estimated.